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MEMOTECH
MEMOPAK
32K

**Read Me First -
Before You Start!**

MEMOTECH Makes The Most Of Your ZX81

Hello User,

We expect you are already getting lots of fun and use out of your Sinclair ZX81 Computer (or your ZX80!).

We think this will grow with the addition of the MEMOPAK 32K, as you will now be dealing with much bigger programs and arrays.

You're now in a position to compete with some of the much more expensive home, office and workshop computers on the market. And if you already have a 16K memory pack, you will now have a total of 48K RAM. See the back of this booklet for details of how to use both of them together.

We hope you like the elegant design. Now let's try to answer some of your queries.

How do I set up the MEMOPAK 32K?

Make sure your power supply is not connected to the ZX81 when you plug the pack into the back. You will find it plugs in firmly enough to be used safely; but to cut all wobble, you can use the three Velcro tabs as well.

Now you will have the ZX81 and the pack looking and acting like one unit. If you have the Sinclair printer, this will plug neatly into the back of the memory.

Now you can join up the power supply to your ZX81.

What should I do to use the new, larger memory area?

On powering up, a small K will appear in the *bottom left hand corner of the screen*. This means that your system is ready to go, but the computer is expecting to use only a maximum of 16K. So you'll probably want to tell the computer that more memory is present. On the other hand, you do not have to use all available memory (See Chapter 26 of the ZX81 handbook).

There is a memory location which you change in order to tell the computer the upper limit of your memory (or RAMTOP if you're into the jargon). This is 16389. To set top of RAM at 48K, type the following POKE 16389, 192 (this is usually set at 128 for a 32K limit).

NEW (the memory is now cleared to start afresh; and will now be organised to the new limit)

To check the current top of RAM, type
PRINT PEEK 16389
and the value 192 should appear in the top left-hand corner of the screen.
For a quick check that the memory is now at your finger-tips you can now try the following little programs:

```
10 DIM A$(60,500)
    or
10 DIM A(6000)
    or
10 POKE 48000, 128
20 PRINT PEEK 48000
```

What is where?

As programs are entered into the system the elements are sifted into the instruction file and the array file. The instruction file, the display file (holding screen data) and the array file lie next to each other in that order at the bottom end of memory. Gradually, as the instruction file increases, the other files are pushed up through memory. Remember, the original 1K of RAM in the ZX81 (located at 16K+) has been disabled and all its functions take place in the MEMOPAK.
This pushing goes on until either the array file reaches the top of the memory or until the display file begins to straddle the 32K mark (by going above 32767).

Does this mean if I've got 32K or more of RAM, I still can't have more than 15K or so of instructions?

No. Many people think you are restricted but there is a neat trick where you can force your display file to leap the 32K mark in one bound by putting in a large, dummy instruction. The important thing is to make sure that the display file never straddles the 32K mark. Here is how:

a) On input, check from time to time the value in the VARS system variable, as this lies just above the end of the display file:
PRINT PEEK 16401 * 256+PEEK 16400
b) When the values of VARS approaches 32767, enter a huge line into the program, like:
LET ZERO = 0 + 0 + 0 + 0 etc.
with about 100 repetitions of [+0].
This will push the display file entirely above 32768.
c) Check the system variable D-FILE to make sure the display file now begins above 32768:
PRINT PEEK 16397 * 256+PEEK 16396
If it is, then you can carry on programming.

How can I use the MEMOPAK 32K if I've got a white ZX80?

The MEMOPAK 32K drives the ROM directly — but with the ZX80 it can't do this unless you first carry out the following simple hardware modifications.

a) Break the connecting track between IC6-Pin7 and IC2-Pin20.
b) Put a 680 ohm resistor between IC6-Pin7 (74LS157N) and IC2-Pin20(ROM).
c) Connect IC2-Pin20 to the edge connector plug 23B (ROM C.S.) This is the finger furthest away from the keyway slot and on the underside of the board.

We regret we cannot offer this service ourselves and we cannot accept responsibility for malfunction as a result of this modification, such as screen glitches.

Have you any tips for running a full ZX81 system?

Yes. These are the hints buzzing around the users. They may or may not help in your situation.
When connected to MEMOPAK 32K and printer, make sure that LOADing takes place with cassette recorder volume set at maximum. If possible make sure that your cassette recorder and ZX81 are plugged into different mains sockets. Maybe you shouldn't have the LOAD (EAR) and SAVE (MIKE) connectors plugged in at the same time. LOADing is more likely to be successful

if you quote the filename, rather than null ("").
Always keep the connectors clean. Don't use the first 20 seconds of the cassette tape.

Can I run programs written for a 16K pack with the MEMOPAK 32K?

Yes, they should run straight away, but things are a little tricky if you want to enlarge your arrays to use the larger memory and you have been SAVEing your data. Basically, you have to re-enter all data after you have re-dimensioned, to be sure that the right data is going to be accessed. What you can do is:

a) Load the original program.

b) Edit in a special routine which will list and label the contents of all variables on the printer.

c) Run this routine. You now have a hard copy of your data.

d) Re-set your dimensions. Also enter a routine to allow you to re-input all your old values plus any new ones.

e) Run your program and enter the values.

It's probably quickest to start afresh!
You may also encounter problems if you have been using machine code routines with the ZX81 alone.

A couple of program examples

BASIC strings are stored in the instruction area of RAM. This means that when you set a literal, say,

```
LET A$ = "CAT"
```

the word CAT is actually duplicated, once as a literal as part of the instruction, and once in the variable area A$. It would be more economic if we could set up an initialisation routine which would store all literals once only — in the variables area. This simple loop would let you input up to 10 strings of 20 characters each:

```
10  DIM A$(10,20)
20  INPUT I
30  IF I = 0 THEN GOTO 70
40  INPUT B$
50  LET A$(I) = B$
60  GOTO 20
```

```
70  INPUT I
80  IF I = 0 THEN GOTO 110
90  PRINT A$(I)
100 GOTO 70
```

```
110 REM AUTOMATIC SELF SAVE
120 SAVE "SELF"
130 GOTO 20
140 STOP
```

Breakdown:
Lines 20—60 Store strings
Lines 70—100 Display strings
Lines 110—140 Save program with string arrays

Now look carefully at the instructions from line 110. With increased array capacity in the memory you will probably want to store your data more permanently. The ZX81 system does not (at least as yet) support free-standing files but it is possible to save your arrays (and their contents) along with your program.
However, it's important that when you next load the program, it does not carry out a RUN but a GOTO instead; otherwise RUN will automatically clear the arrays. This program will SAVE itself automatically (line 120). When you next LOAD it will pick up straight away at line 130 — the line after the SAVE — and branch back to the line quoted there (in this case 20). In this way the RUN instruction is avoided and the variables are not cleared. But make sure you don't branch back to a point where you re-dimension the array you're trying to save!

Can I use the MEMOPAK 32K in conjunction with a 16K pack?

Yes, all you have to do is plug your other pack as a slave unit onto the back of our 32K pack. There are three possible slave units:
a) Our earlier MEMOPAK 16K. This is the one without a switch. Here some minor hardware modifications need to be made. Please ring or write for details.
b) Our later MEMOPAK 16K. This 16K pack has been designed to combine with either the MEMOPAK 32K or another 16K pack.

according to its switch setting. Details will appear in our new MEMOPAK 16K booklet.
c) The Sinclair 16K pack. In this case, you will probably want to place the Sinclair printer between the two packs.

Fit the ZX81 and the packs and the printer together. You will now have 48K of RAM available, and to use this you will need to set a new RAMTOP each time you power up:

```
POKE 16389, 255
NEW
```

Good Luck from all at MEMOTECH.

NOTES

FURTHER INFORMATION ON MEMOTECH PRODUCTS

Memotech produce a range of add-on Memopaks for the ZX81. We will be pleased to send information sheets on any of the following packs:

	Please Tick
• **Plug-in Keyboard**	☐
• **64K RAM PACK**	☐
• **32K RAM PACK**	☐
• **16K RAM PACK**	☐
• **Hi-Res Graphics**	☐
• **Centronics Type Interface**	☐

COMING SOON

RS232 Interface
Digitising Tablet

We'll let you know, via our Press advertisements, when information becomes available on the above products.
Please send this page to the address given on the back cover of this leaflet.

MEMOTECH
Explores the Excellence of your
ZX81

WHY CHOOSE MEMOTECH?

Memotech systems are used not just in the home and in small businesses, but also in larger organisations where localised, efficient data handling is required. We feel this is due to the advantages users gain from the points listed below.

- **reliable and efficient in operation**
- **compact, stylish, high quality extruded aluminium casing**
- **forward compatibility with Memotech products**
- **extensive documentation with sample programs**
- **flexibility of operation modes**
- **full guarantees/refunds or replacement**
- **exchange options (16K)**
- **full after-sales service**
- **efficient quality control**

INSTRUCTION MANUALS

Memotech provide substantial documentation for all their products, in the form of individual booklets for each Memopak. In addition to basic information on how to use your Memopak the booklets contain program examples and material on the internal architecture and functions plus our guarantee for use in the unlikely event of any malfunction.

Guarantee

April 1982

This product is guaranteed free from defects in material and workmanship for a period of six months from the date of purchase subject to the following conditions:

1. **The guarantee does not cover any damage caused through neglect, incorrect adjustment, accident or mis-use and will be invalidated if the product is modified or altered in any way or repaired by anyone other than Memotech Corporation.**
2. **Claims under this guarantee must be made by sending the product (well packed preferably in its original packing) to the address below.**
3. **This guarantee is valid only in the case of a purchaser resident in the United States.**

Memotech Corp
7550 West Yale Avenue
Suite 200
Denver, Colorado 80227

Model: MEMOPAK 32K

Serial No: (if any).....

Date of Purchase:.....

Owner's Name:.....

Owner's Address:.....

.....

.....

Method of Purchase*.....

Place of Purchase.....

*** Please enclose evidence of purchase (receipt etc.) as without this we will be unable to give a refund or replace this item.**

WHAT THEY SAY ABOUT MEMOTECH

"a Rolls Royce add-on."
"The new RAMS from **Memotech** are beautifully designed and blend in really well with the styling of the ZX81."

ZX Computing
Aug/Sept 1982

"The **Memopak** is undoubtedly the ultimate memory expansion for the Sinclair. Try DIM A (9500)!"
"The documentation is good—answering first-time users' questions. It also gives demonstration programs."

Syntax
August 1982

"The 64K version has four switches visible in its rear which allow you to switch out the area between 8K and 16K in the memory map in 4K blocks. This is an excellent idea and I hope other manufactuers will follow this lead . . . Only the **Memotech** allows you to add something between 8K and 16K."

ZX Computing
Aug/Sept 1982

"Anyone who wishes to use his Sinclair for any form of data handling—address lists, stock control, etc., would very quickly run out of space . . . the **Memotech** 64K RAM is designed to overcome this problem."

Hobby Electronics
June 1982

". . . there's no denying that the **Memotechs** are the best-styled and the best-made RAM packs on the market."

ZX Computing
Aug/Sept 1982